PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Social Networks, Leisure Activities and Maximum Tongue Pressure: Cross-sectional Associations in The Nagasaki Islands Study
AUTHORS	Nagayoshi, Mako; Higashi, Miho; Takamura, Noboru; Tamai, Mami; Koyamatsu, Jun; Yamanashi, Hirotomo; Kadota, Koichiro; Sato, Shinpei; Kawashiri, Shin-ya; Koyama, Zenya; Saito, Toshiyuki; Maeda, Takahiro

VERSION 1 – REVIEW

REVIEWER	Eduardo Faerstein State University of Rio de Janeiro, Brazil
REVIEW RETURNED	27-Apr-2017

GENERAL COMMENTS	Issue of increasing relevance as populations age...and the use of noninvasive low-cost procedure to prevent pneumonias is very relevant.

REVIEWER	Jun Aida Tohoku University, Japan
REVIEW RETURNED	08-May-2017

GENERAL COMMENTS	Thank you for giving me the opportunity to review the paper. The paper focused on very important topic, and measurements used, tongue pressure, is new. The paper is well written. I have several comments to improve the manuscript. 1. Introduction: “Tongue-pressure measurement has been recently identified as a useful proxy for risk of aspiration”: Reference is needed. 2. “We hypothesized that social environment and daily activities may influence tongue pressure.”: Hypothesis is suddenly appeared. Brief explanation (mechanism) on the association between social environment and daily activity on tongue pressure should be added introduction. 3. Study sample: Please describe survey design and response rate. These are essential for representativeness of the study. And representativeness should be mentioned in strength and limitation section. 4. Number of household, 2.08, should be shown with SD.

	5. The age range of present study was large. And tongue pressure was differing by age (figure 1). Please add ages stratified analysis. 6. Results on interaction terms were unclear. Please show all p-values for each interaction terms. 8. Discussion: Mechanism between social environments and tongue pressure is not well described. Why there were difference between within and beyond networks? Leisure activity included inside home activity. Is it increase social relationships? 9. Authors mentioned the measurements of social environment as strength. However, these measurements of social environments do not necessary reflecting mechanism on tongue. Speaking and eating with others seemed important mechanism. Therefore, frequency of meet friend is more appropriate measurement in relation to the mechanism. However, the measurements in this study is not. 10. There are possibility of bi-directional relationships between social factors and oral health. For example, Koyama et al. shows association of oral health on homebound in cohort study, and they mentioned possibility of bi-directional association. 1. Koyama S, Aida J, Kondo K, et al. Does poor dental health predict becoming homebound among older Japanese? BMC oral health 2016;16(1):51. doi: 10.1186/s12903-016-0209-9

REVIEWER	Maha El Tantawi College of Dentistry, University of Dammam, Saudi Arabia
REVIEW RETURNED	27-May-2017

GENERAL COMMENTS	The manuscript describes an interesting study that addresses a subject with increasing importance as the elderly population increases globally. The authors studied several aspects with varied tools. The manuscript has generally good flow and provides useful insights into future research. Some English revision may be needed after the scientific issues are addressed. There are some comments related to the statistical tests used and the analysis plan. There is also a need to explain in Introduction about the rationale behind looking into sex differences. More information are needed in Methods. Detailed comments are included in the attached file. The reviewer also provided a marked copy with additional comments. Please contact the publisher for full details.

VERSION 1 – AUTHOR RESPONSE

Response to Reviewer #1 Comments

Comment: Issue of increasing relevance as populations age...and the use of noninvasive low-cost procedure to prevent pneumonias is very relevant.

Response: We appreciate your comments. We hope this paper will help improve awareness that social environment and daily activities could be important factors in maintaining tongue pressure, and preventing oral frailty and subsequent dysphagia/aspiration pneumonia.

Response to Reviewer #2 Comments

Comment: Thank you for giving me the opportunity to review the paper. The paper focused on very important topic, and measurements used, tongue pressure, is new. The paper is well written. I have several comments to improve the manuscript.

Response: Thank you for your comments, which have helped us to improve the paper considerably.

Comment 1. Introduction: “Tongue-pressure measurement has been recently identified as a useful proxy for risk of aspiration”: Reference is needed.

Response: We have added the necessary reference.[1][2]
(INTRODUCTION, page 5, 2nd paragraph)

Comment 2. “We hypothesized that social environment and daily activities may influence tongue pressure.”: Hypothesis is suddenly appeared. Brief explanation (mechanism) on the association between social environment and daily activity on tongue pressure should be added introduction.

Response: We have added more explanation of the thinking behind the hypothesis:
(INTRODUCTION, page 5, 3rd paragraph):
“We hypothesized that social environment and daily activities may influence tongue pressure, because having social networks and taking part in leisure activities may increase opportunities to move the tongue.”

Comment 3. Study sample: Please describe survey design and response rate. These are essential for representativeness of the study. And representativeness should be mentioned in strength and limitation section.

Response: We have included a description of the survey design and information about the response rate in the Methods section (METHODS, page 5, 4th paragraph). We also mentioned the representativeness in the limitations section:
(DISCUSSION, page 17, 2nd paragraph):
“Sixth, the study response rate was under 20% in the target population in the city, which may have led to population bias. However, we believe that the high rate of agreement to participate (94%) is likely to have minimized any bias among the population.”

Comment 4. Number of household, 2.08, should be shown with SD.

Response: The number of households is now shown with SD (RESULTS, page 11, 2nd paragraph)

Comment 5. The age range of present study was large. And tongue pressure was differing by age (figure 1). Please add ages stratified analysis.

Response: A table showing age-stratified results (<, ≥ 65 years old) is included at the end of this letter. The result shows the association was attenuated in younger women and older men, which may be partially influenced by age-related social environment differences and/or tongue pressure. However, we have chosen not to include this table in this paper because we cannot assess the most appropriate cut-off age for the associations, partly because we have limited population data to use to explore this. Further research with a larger sample size or prospective design would be needed to investigate whether there are age-specific associations. We have added this to the limitations section. (DISCUSSION, page 17, Strengths and Limitations)

Comment 6. Results on interaction terms were unclear. Please show all p-values for each interaction terms.

Response: We have now included p-values for all interaction terms.
(RESULTS, page 14, 2nd paragraph)

Comment 6. Discussion: Mechanism between social environments and tongue pressure is not well described. Why there were difference between within and beyond networks? Leisure activity included inside home activity. Is it increase social relationships?

Response: As you pointed out, we did not have any detailed information about social networks or leisure activities. We have already included this in the limitations section. (Please see DISCUSSION; page 17, Strengths and Limitations)
We have also explained in the Discussion section that we think differences in the frequency of interactions in daily life could influence the results on social networks. (Please see DISCUSSION; page 15, 3rd paragraph):
“The difference in frequency of social interactions in daily life could explain why only social networks involving neighbors, and not those beyond, were associated with higher tongue pressure in this study.”
As you suggested, leisure activities may be both inside and outside the home, and our data did not allow us to separate them. We have suggested that the possible mechanisms for higher tongue pressure in people participating in leisure activities are higher social interaction, higher physical and mental activities, and “Ikigai” related to the leisure activities. We have revised the sentence to make it clearer (Please see DISCUSSION; page 16, 2nd paragraph). Further research would be needed to examine the effects of leisure activities with and without social interactions.

Comment 7. Authors mentioned the measurements of social environment as strength. However, these measurements of social environments do not necessary reflecting mechanism on tongue. Speaking and eating with others seemed important mechanism. Therefore, frequency of meet friend is more appropriate measurement in relation to the mechanism. However, the measurements in this study is not.

Response: We agree that speaking and eating with others could be important mechanisms to prevent oral frailty. As we mentioned in the limitation section (DISCUSSION, page 17, 2nd paragraph), we have no detailed information on social network quality (e.g., relationship or closeness) or quantity (e.g., number involved in the social networks, and frequency of communications). Further research should consider frequencies of speaking and eating to assess the association.
There is currently limited epidemiological evidence about risk factors for lower maximum tongue pressure, and we hope our results will encourage this type of research in the future.

Comment 8. There are possibility of bi-directional relationships between social factors and oral health. For example, Koyama et al. shows association of oral health on homebound in cohort study, and they mentioned possibility of bi-directional association.
1. Koyama S, Aida J, Kondo K, et al. Does poor dental health predict becoming homebound among older Japanese? BMC oral health 2016;16(1):51. doi: 10.1186/s12903-016-0209-9

Response: We have added an explanation about the possibility of bi-directional relationships between social factors and oral health.
(DISCUSSION, page 17, 2nd paragraph)

Response to Reviewer #3 Comments

Comment: The manuscript describes an interesting study that addresses a subject with increasing importance as the elderly population increases globally. The authors studied several aspects with varied tools. The manuscript has generally good flow and provides useful insights into future research. Some English revision may be needed after the scientific issues are addressed.
There are some comments related to the statistical tests used and the analysis plan. There is also a need to explain in Introduction about the rationale behind looking into sex differences. More information are needed in Methods. Detailed comments are included in the attached file.

Response: Thanks very much for your comments and suggestions, which have helped us to improve the paper. We have also had the paper edited by a native English speaker.

Comment 1. Pls check if "which" is the right word here.

Response: Thank you for noticing this. We have corrected the word.
(INTRODUCTION, page 4, 2nd paragraph)

Comment 2. Please explain what were the inclusion criteria? was a mental screening (mini mental...) performed before elderly subjects were included? How many were older than 65years? why were not only >65 years subjects included; where oral frailty would be expected?
where were these annual checks conducted? a primary health care unit? other setting?
how was the sample selected from those who attended?

Response: We have provided more information about the setting and how we selected the participants in the Methods section (METHODS - Study sample, page 5, 4th paragraph).
There is very limited epidemiological evidence about risk factors for lower maximum tongue pressure. The prevalence of oral frailty measured by maximum tongue pressure by age groups is also unknown. We thought that dysphagia and related aspiration pneumonia prevention were important not only for older people but also younger populations, and therefore included both those aged over 65 years old (72% in the current study) and younger participants. We have mentioned this as one of our aims in the Introduction. (INTRODUCTION, page 4, 1st paragraph)

For reference, we have included a table showing age-stratified results (<, ≥ 65 years old) at the end of this letter. We have, however, chosen not to include these results in the paper because we cannot accurately assess the proper age cut-off point for the associations, and we have limited population data to use to explore this. Further research with larger sample sizes or a prospective design would be needed to investigate whether there are age-specific associations.

Comment 3. Pls check the grammar/ structure of this sentence

Response: We apologize that the text was unclear. We have corrected this sentence and also had the article edited by a native English speaker.
(METHODS - Social environment assessment, page 6, 2nd paragraph)

Comment 4. asked about?

Response: Thank you for pointing this out. We have corrected this.
(METHODS - Social environment assessment, page 6, 3rd paragraph)

Comment 5. Please explain in which language was the questionnaire used. If the original language was English and it was translated, was it validated? pilot-tested? the reference cited does not look like it was developed in Japanese

Response: The Japanese version of the K6 was developed by Furukawa et al in 2008 using the standard back-translation method in a psychiatric epidemiologic study conducted in seven communities across Japan with 2436 participants. The authors demonstrated screening performances that were essentially equivalent to those of the original English versions. We have added another reference for the Japanese version of the K6.[3]
(METHODS - Measurement of covariates, page 7, 3rd paragraph)

Comment 6. Please explain how it was measured: non digital/ digital method?

Response: We measured blood pressure using digital devices, and have added this information to the text.
(METHODS - Measurement of covariates, page 7, 3rd paragraph)

Comment 7. Please explain if this data was routinely available for all or some participants and for how many.

Response: All measurements are routinely provided for all participants, and we have added this information to the Methods section.
(METHODS - Measurement of covariates, page 7, 3rd paragraph)

Comment 8. why were descriptive stats displayed by gender?
Does this mean ANOVA was used to compare between males and females? how can this be done?

Response: Previous studies have reported sex differences in maximum tongue pressure[4]. Cultural gender roles in Japan may also influence social environment and behavior, so we hypothesized that there may be sex differences in the associations between social environment and daily activities and tongue pressure. We have added more about the rationale for this hypothesis in the Introduction section.
(INTRODUCTION - page 5, 3rd paragraph)
We have also corrected the explanation about statistics, as Student's t-tests and $\chi 2$ tests were used.
(METHODS - Statistical analysis, page 7, 4th paragraph)

Comment 9. correlation between what?

Response: We have corrected the information about the statistical method used, and provided a detailed explanation of the analysis:
(METHODS - Statistical analysis, page 8, 1st paragraph)
“Association between marital status and number of family members in the household was assessed by Wilcoxon rank-sum test. We used $\chi 2$ tests to examine whether there were links between marital status, social networks and leisure activity.”

Comment 10. why was there a need to produce separate estimates for the genders? (METHODS-Statistical analysis, Page 7)

Response: We have added more about the rationale for this to the Introduction.
(INTRODUCTION - page 5, 3rd paragraph)

Comment 11. Why is this part included here NOT in the Results? (RESULTS, Page 8)

Response: We have moved these sentences to the Results section.
(RESULTS - page 11, 2nd paragraph)

Comment 12. Please explain in Materials and Methods why these cut points were used and what they signify?

Response: We have shown the proportions of each age group (40–49, 50–59, 60–69, 70–79, and 80 years or over) in each maximum tongue pressure band (<19.9 kPa, 20.0–29.9 kPa, 30.0–39.9 kPa, and ≥ 40 kPa) (Figure 1 in the text). There is currently no validated cut-off point for the maximum tongue pressure that indicates oral frailty[1][5], but we have used this as an indication of the association between age and increasing oral frailty. We have added an additional cut-off point (40 kPa) to help readers. An explanation has been added to the Methods.
(METHODS - Statistical analysis, page 7, 4th paragraph)

Comment 13. Please display the frequency/ number along with the % for all variables.
Response: Table 1 now includes both number and % for all variables.
(TABLE 1, page 9)

Comment 14. Please explain how the number of family members (a quantitative variable) can be correlated with marital status (a yes/ no variable)?
the same applies to participation in activities and network beyond neighbors....
Actually the same applies for all relationships in the paragraph: how/ why is Spearman rho used to assessed the relationship between dichotomous vars? why was not chi square (for 2 dichotomous variables) used or t test (number of family members in those with and without partners)? On a broader scale, how does this address the study aim/s?

Response: As you pointed out, the statistical method used was not appropriate here. We have corrected this using Wilcoxon rank-sum and chi-squared tests. Those analyses were to assess whether there were links between each of marital status, social networks within/beyond neighbors and leisure activities. We added an explanation to the Methods section, and the results have been revised.
(METHODS - Statistical analysis, page 8, 1st paragraph)
(RESULTS - page 11, 2nd paragraph)

Comment 15. Please explain why the model is split by gender. (Table 2, Page 12)

Response: We have added an explanation of this to the Introduction.
(INTRODUCTION - Page 5, 3rd paragraph)

Comment 16. If there is a reason that sex affects the association, please indicate that the assessment of this association is one of the aims and, more importantly, explain the rationale for it in the Introduction.
(RESULTS - Sex-Specific Association in Social Environment and Maximum Tongue Pressure, Page 14)

Response: We have added an explanation of the rationale to the Introduction.
(INTRODUCTION - page 5, 3rd paragraph)

Comment 17. Please notice that reference #42 is a systematic review. If the study referred to here was included in this review, it needs to be directly cited.

Response: We have now cited the appropriate reference.
(DISCUSSION, page 15, 1st paragraph)

Comment 18. Part of this needs to be included in the Intro to help readers understand the rationale for looking into sex specific differences (Discussion, Page 16)

Response: We have added the rationale for looking at sex-specific differences to the Introduction.
(INTRODUCTION - page 5, 3rd paragraph)

Comment 19. This association was not significant, right? It should not e grouped in the Conclusions with the two significant variables

Response: We meant that it was important to focus on the differences between types of social networks, and have amended this to make it clearer.
(CONCLUSION - page 18)

Comment 20. Please add measure of models' usefulness like R2 for example
(Supplemental Table 1., Page 25)

Response: We have added the R2 to all tables.
(Table 2; page 12, Supplemental Table 1)

References in this letter

[1] K. Tsuga, Maximum voluntary tongue pressure measurement with a disposable intra-oral probe and handy manometric device (in Japanese), Japanese Soc. Stomatognathic Funct. (2010) 41–44.
[2] M. Yoshida, T. Kikutani, K. Tsuga, Y. Utanohara, R. Hayashi, Y. Akagawa, Decreased tongue pressure reflects symptom of dysphagia, Dysphagia. 21 (2006) 61–65. doi:10.1007/s00455-005-9011-6.
[3] T.A. Furukawa, N. Kawakami, M. Saitoh, Y. Ono, Y. Nakane, Y. Nakamura, et al., The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan., Int. J. Methods Psychiatr. Res. 17 (2008) 152–8. doi:10.1002/mpr.257.
[4] H.C. Crow, J. a Ship, Tongue strength and endurance in different aged individuals., J. Gerontol. A. Biol. Sci. Med. Sci. 51 (1996) M247-50. http://www.ncbi.nlm.nih.gov/pubmed/8808997.

[5] Y. Utanohara, R. Hayashi, M. Yoshikawa, M. Yoshida, K. Tsuga, Y. Akagawa, Standard values of maximum tongue pressure taken using newly developed disposable tongue pressure measurement device, Dysphagia. 23 (2008) 286–290. doi:10.1007/s00455-007-9142-z.

VERSION 2 – REVIEW

REVIEWER	Jun Aida Tohoku University, Japan
REVIEW RETURNED	26-Jul-2017

GENERAL COMMENTS	The authors improved the manuscript. I understand that the authors decide not to show the age-stratified results. However, this reviewer still concerns about the analysis. 1. Category of age variable Was age included as the continuous variable or category variable in the multiple linear models? Please clarify it. If continuous variable is applied, because age-range was wider, please check the results of the analysis when age was included as the category variable (e.g. 40-49, 50-59,…). 2. Coefficient B Table 2 shows only the B coefficient. Adding “standardized B” into the table help the understanding of the strength of the association of each variable. In addition, because mean tongue pressure of each variables and categories were not shown, it is difficult to understand the meaning of B coefficient. Adding tongue pressure in Table 1 is needed. Standardized B and mean tongue pressure are very important to understand the result. Please add them into the paper. Sorry for I could not recognize this point at the 1st review.

REVIEWER	Maha El Tantawi College of Dentistry, University of Dammam, Saudi Arabia
REVIEW RETURNED	17-Jul-2017

GENERAL COMMENTS	The authors addressed all my previous concerns and I thank them for that and for the useful study and well-written manuscript.

VERSION 2 – AUTHOR RESPONSE

Response to Reviewer #2 Comments

Comment: The authors improved the manuscript. I understand that the authors decide not to show the age-stratified results. However, this reviewer still concerns about the analysis.

Response: Thank you for your comments. We have responded to reviewer's concerns in a point-by-point manner, and added further revisions in the manuscript.

Comment 1. Category of age variable
Was age included as the continuous variable or category variable in the multiple linear models? Please clarify it. If continuous variable is applied, because age-range was wider, please check the results of the analysis when age was included as the category variable (e.g. 40-49, 50-59,…).

Response: Age was included as a continuous variable in the linear regression model in this study. We added explanation in the Methods (page 8, 1st paragraph). A table showing results when age was included as categorical variables (40-49, 50-59, 60-69, 70-79, ≥80) is at the end of this letter (Reference Table). Although some associations were slightly attenuated, our main results were qualitatively not altered. Therefore we decided keep our original tables.

Comment 2. Coefficient B
Table 2 shows only the B coefficient. Adding "standardized B" into the table help the understanding of the strength of the association of each variable.
In addition, because mean tongue pressure of each variables and categories were not shown, it is difficult to understand the meaning of B coefficient. Adding tongue pressure in Table 1 is needed. Standardized B and mean tongue pressure are very important to understand the result. Please add them into the paper. Sorry for I could not recognize this point at the 1st review.

Response: We added standardized B in Table 2 and Supplemental Table 1, and mean tongue pressure for the each categories in Table 1 as requested.

Response to Reviewer #3 Comments

Comment: The authors addressed all my previous concerns and I thank them for that and for the useful study and well-written manuscript.

Response: We appreciate your comments, which have helped us to improve the paper substantially.

VERSION 3 – REVIEW

REVIEWER	Jun Aida Tohoku University, Japan
REVIEW RETURNED	02-Oct-2017

GENERAL COMMENTS	The authors improve the manuscript and I have no additional comments.